



DEPARTMENT OF THE AIR FORCE
59TH MEDICAL WING (AETC)
JOINT BASE SAN ANTONIO - LACKLAND TEXAS

17 FEB 2017

MEMORANDUM FOR SGDTG

ATTN: CAPT EVAN ROBERTS

FROM: 59 MDW/SGVU

SUBJECT: Professional Presentation Approval

1. Your paper, entitled Fracture Strength of Titanium-Based Lithium Disilicate and Zirconia Abutment Crowns presented at/published to International Association of Dental Research, San Francisco, CA, 22-26 March 2017 in accordance with MDWI 41-108, has been approved and assigned local file #17078.
2. Pertinent biographic information (name of author(s), title, etc.) has been entered into our computer file. Please advise us (by phone or mail) that your presentation was given. At that time, we will need the date (month, day and year) along with the location of your presentation. It is important to update this information so that we can provide quality support for you, your department, and the Medical Center commander. This information is used to document the scholarly activities of our professional staff and students, which is an essential component of Wilford Hall Ambulatory Surgical Center (WHASC) internship and residency programs.
3. Please know that if you are a Graduate Health Sciences Education student and your department has told you they cannot fund your publication, the 59th Clinical Research Division may pay for your basic journal publishing charges (to include costs for tables and black and white photos). We cannot pay for reprints. If you are 59 MDW staff member, we can forward your request for funds to the designated wing POC.
4. Congratulations, and thank you for your efforts and time. Your contributions are vital to the medical mission. We look forward to assisting you in your future publication/presentation efforts.

Linda Steel-Goodwin

LINDA STEEL-GOODWIN, Col, USAF, BSC
Director, Clinical Investigations & Research Support

PROCESSING OF PROFESSIONAL MEDICAL RESEARCH/TECHNICAL PUBLICATIONS/PRESENTATIONS

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USE ONLY THE MOST CURRENT 59 MDW FORM 3039 LOCATED ON AF E-PUBLISHING

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 - b. In Section 2, there may be funding available for journal costs, if your department is not paying for figures, tables or photographs for your publication. Please state "YES" or "NO" in Section 2 of the form, if you need publication funding support.
2. Print your name, rank/grade, sign and date the form in the author's signature block or use an electronic signature.
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4. Attach a copy of your abstract, paper, poster and other supporting documentation.
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"The experiments reported herein were conducted according to the principles set forth in the National Institute of Health Publication No. 80-23, Guide for the Care and Use of Laboratory Animals and the Animal Welfare Act of 1966, as amended."

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15. AUTHORSHIP AND CO-AUTHOR(S) List in the order they will appear in the manuscript.			
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e.			
f.			
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Fracture Strength of Titanium-based Lithium Disilicate and Zirconia Abutment Crowns

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ABSTRACT #



INTRODUCTION

Ivoclar Vivadent has combined the concept of CAD-CAM fabrication and esthetic-ceramic abutments. The IPS e.max CAD abutment is a lithium-disilicate block with a screw channel which can be milled to fabricate a hybrid abutment or hybrid-abutment crown. The hybrid abutment or hybrid-abutment crown is cemented onto a titanium-based platform, creating a hybrid of metal and ceramic. One permutation, involves drilling a access in the crown's occlusal surface, cementing the abutment and crown extraorally and then delivering the final restoration as a screw-retained prosthesis.

OBJECTIVE

The purpose of this study was to evaluate the strength properties of lithium disilicate to act as a hybrid-abutment crown, hybrid abutment, and "screwmentable" hybrid-abutment and crown in comparison to zirconia as a hybrid abutment when cemented to a titanium base.

MATERIALS and METHODS

An implant (Certain 4.1mm, Biomet 3i) was cemented into a resin cylinder using a flowable composite, scanned with a ScanPost (Sirona) and OmniCam Acquisition Unit (Sirona). A premolar-shaped crown was designed. Four groups of 10 specimens each were milled (MCXL, Sirona). Group 1: lithium-disilicate hybrid-abutment crown; Group 2: lithium-disilicate hybrid abutment/lithium-disilicate crown; Group 3: "screwmentable" lithium-disilicate hybrid abutment/lithium-disilicate crown with screw channel created with a bur and filled with composite resin; and Group 4 (control): zirconia hybrid abutment (InCoris ZI meso, Sirona)/lithium-disilicate crown. A TiBase (Sirona) was placed in each of the forty mounted implants. The groups were cemented onto the TiBase following manufacturer's recommendations, thermocycled (2000 cycles, 5 – 55° C) and cyclically loaded (150N, 100,000 cycles, 1Hz). Specimens were fractured in an Instron using a 6mm-diameter cylindrical piston resting on the buccal and lingual cusps. Fracture load data was analyzed with a One-Way ANOVA/Tukey's ($\alpha=0.05$). Fracture modes were categorized as restoration intact, >50% of abutment intact with some intact crown remaining, <50% of abutment intact with some intact crown remaining, >50% of abutment intact without intact crown remaining, <50% of abutment intact without intact crown remaining, only the TiBase remaining, and finally prosthetic screw fracture.



Lithium Disilicate Hybrid Abutment Crown

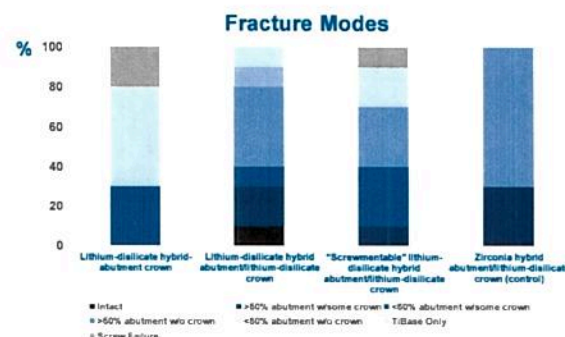
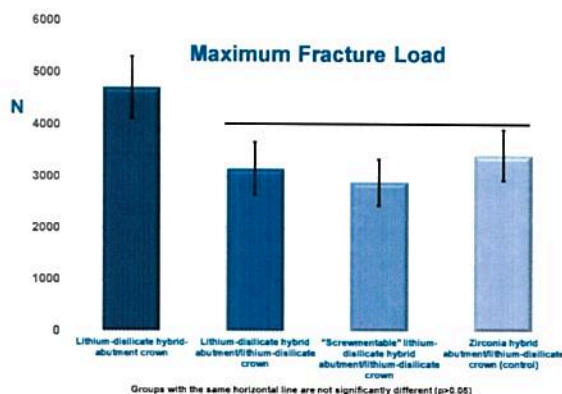


Zirconia abutment and Lithium Disilicate Crown

RESULTS

A significant difference was found in maximum fracture load between groups ($p<0.001$). The lithium-disilicate hybrid-abutment crown had significantly greater fracture strength than all the other groups which were not significantly different from each other.

The most frequently observed fracture mode for each group was as follows: Group 1) lithium-disilicate hybrid-abutment crown - only the TiBase remaining; Group 2) lithium-disilicate hybrid abutment/lithium-disilicate crown - >50% of the abutment without intact crown Group 3: "screwmentable" lithium-disilicate hybrid abutment/lithium-disilicate crown - an equal number (30% each) where >50% of the abutment remained without intact crown and <50% of the abutment remained with some intact crown remaining; and Group 4: zirconia hybrid abutment/lithium-disilicate crown - >50% of the abutment without intact crown



CONCLUSIONS

Based on fracture strength properties, the new lithium-disilicate abutment material may serve as a viable alternative to the use of the zirconia abutment/lithium-disilicate crown (control). The lithium-disilicate hybrid-abutment crown had the greatest fracture strength.

**59th Medical Wing (59th MDW)
Institutional Review Board (IRB)**
59th Clinical Research Division/SGVUS/(210) 292-7143
2200 Bergquist Dr, Bldg 4430, Lackland AFB, TX 78236-5300

25 Nov 15

FINAL DETERMINATION – NON-HUMAN RESEARCH

Determination Date: 25 Nov 2015

Project Lead: Capt Evan Roberts/SGDTG

Reference Number: FWH20160024N

Project Title: Fracture Strength of Titanium-based Lithium Disilicate and Zirconia Abutments

You may begin your project, as you would any other clinical or operational activity, with the approval and sponsorship of your leadership.

Your project was determined on 25 Nov 2015 to be considered **not human research** as defined by DoD regulation **32 CFR 219 and FDA regulation 21 CFR 56**. Continued IRB oversight for this activity is not required. The proposed project does not include non-routine intervention or interaction with a living individual for the primary purpose of obtaining data regarding the effect of the intervention or interaction, nor do the researchers obtain private, identifiable information about living individuals.

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